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First Named Inventor	Ido, Takeshi
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ENCLOSURES *(Check all that apply)*

- ☐ Fee Transmittal Form
  - ☐ Fee Attached
- ☐ Amendment/Reply
  - ☐ After Final
  - ☐ Affidavits/declaration(s)
- ☐ Extension of Time Request
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- ☐ Information Disclosure Statement
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- ☐ Reply to Missing Parts/ Incomplete Application
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- ☐ Petition to Convert to a Provisional Application
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SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

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Date	August 12, 2005	Reg. No.	41,405

CERTIFICATE OF TRANSMISSION/MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below.

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PATENT
Attorney Docket No.: 16869P-078700US
Client Ref. No.: 340200945US1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

TAKESHI IDO *et al.*

Application No.: 10/626,454

Filed: July 23, 2003

For: STORAGE SYSTEM

Customer No.: 20350

Examiner: Unassigned

Technology Center/Art Unit: 2186

Confirmation No.: 9608

RENEWED PETITION TO MAKE SPECIAL FOR NEW APPLICATION UNDER M.P.E.P. § 708.02, VIII & 37 C.F.R. § 1.102(d)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Decision dated June 20, 2005 dismissing the original petition to make special, Applicants respectfully submit a renewed petition to make special the above-identified application under MPEP § 708.02, VIII & 37 C.F.R. § 1.102(d). The application has not received any examination by an Examiner.

(a) The Commissioner has previously been authorized to charge the petition fee of $130 under 37 C.F.R. § 1.17(i) and any other fees associated with this paper to Deposit Account 20-1430.

(b) All the claims are believed to be directed to a single invention. If the Office determines that all the claims presented are not obviously directed to a single invention, then Applicants will make an election without traverse as a prerequisite to the grant of special status.

(c) Pre-examination searches were made of U.S. issued patents, including a classification search and a computer database search. The searches were performed on or around July 12, 2004, and were conducted by a professional search firm, Kramer & Amado, P.C. The classification search covered Classes 707 (subclasses 200 and 205) and 711 (subclasses 112, 119, 141, 147, 150, and 162). The computer database search was conducted on the USPTO systems EAST and WEST. The inventors further provided four references considered most closely related to the subject matter of the present application (see references #7 to #10 below), which were cited in the Information Disclosure Statement filed with the application on July 23, 2003.

(d) The following references, copies of which were previously submitted, are deemed most closely related to the subject matter encompassed by the claims:

(1) U.S. Patent No. 4,310,883;
(2) U.S. Patent No. 6,073,218;
(3) U.S. Patent No. 6,247,099 B1;
(4) U.S. Patent No. 6,574,709 B1;
(5) U.S. Patent Publication No. 2003/0221077 A1;
(6) U.S. Patent Publication No. 2004/0107325 A1;
(7) U.S. Patent No. 6,467,034 B1;
(8) Japanese Patent Publication No. 07-234811;
(9) Japanese Patent Publication No. 2001-273342; and
(10) Japanese Patent Publication No. 2000-222267.

(e) Set forth below is a detailed discussion of references which points out with particularity how the claimed subject matter is distinguishable over the references.

A. Claimed Embodiments of the Present Invention

The claimed embodiments relate to a plurality of storage systems, in each of which a pair of storage volumes are formed, thereby multiplexing data. More particularly, the invention relates to a technique for accepting access requests from both of a main host computer and a sub-host computer while data matching is kept between those storage volumes.

Independent claim 1 recites a system for storing data, comprising a first storage area to store data; a second storage area to store data; a first storage control unit configured to control the first storage area; and a second storage control unit configured to control the second storage area. In response to a first write request issued to write data in the first storage area, the first storage control unit is configured to write data associated with the first write request to the first storage area and to transfer the first write request to the second storage control unit, the second storage control unit being configured to write the data associated with the first write request to the second storage area. In response to a second write request issued to write data in the second storage area, the second storage control unit is configured to transfer the second write request to the first storage control unit.

Independent claim 5 recites a group of storage systems including a first storage system configured to process requests from a first host system and a second storage system configured to process requests from a second host system and to control a second storage area. The first storage system comprises a first storage area to store data; and a first storage control unit configured to control the first storage area. The first storage control unit is configured, in response to a first write request issued to write data in the first storage area from the first host system, to write data associated with the first write request to the first storage area. The first storage control unit is configured, in response to a second write request issued to write data in the second storage area by the second host system, to receive the second write request prior to writing data associated with the second write request to the second storage area.

Independent claim 8 recites a group of storage systems including a first storage system configured to process requests from a first host system and to control a first storage area and a second storage system configured to process requests from a second host system. The second storage system comprises a second storage area to store data; and a second storage control unit configured to control the second storage area. The second storage control unit is configured, upon receipt from the first storage control unit of a first write request issued to write data in the first storage area from the first host system, to write data associated with the first write request to the second storage area. The second storage control unit is configured, in response to a second write request issued to write data in the second storage area from the second host system, to transfer the second write request to the first

storage system to write data associated with the second write request to the first storage area prior to writing the data associated with the second write request to the second storage area.

Independent claim 11 recites a method of storing data in storage devices. The method comprises, in response to a first write request issued to write data in a first storage area, using a first storage control unit to write data associated with the first write request to the first storage area and transferring the first write request to a second storage control unit to write the data associated with the first write request to a second storage area; and in response to a second write request issued to write data in the second storage area, transferring the second write request from the second storage control unit to the first storage control unit prior to writing data associated with the second write request to the second storage area.

Independent claim 15 recites a method of storing data. The method comprises, in response to a first write request issued to write data in a first storage area from a first host system, writing data associated with the first write request to the first storage area and transferring the first write request to a second storage control unit to write the data associated with the first write request to a second storage area; and in response to a second write request issued to write data in the second storage area by a second host system, receiving the second write request to write data associated with the second write request to the first storage area prior to writing the data associated with the second write request to the second storage area.

Independent claim 17 recites a method of storing data. The method comprises, upon receipt from a first storage control unit of a first write request issued to write data in a first storage area from a first host system, writing data associated with the first write request to a second storage area; and in response to a second write request issued to write data in the second storage area from a second host system, transferring the second write request to the first storage control unit to write data associated with the second write request to the first storage area prior to writing the data associated with the second write request to the second storage area.

Independent claim 20 recites a system for storing data, comprising a first storage area to store data; a second storage area to store data; a first storage control unit configured to control the first storage area, the first storage control unit including a first

connection to connect with a first host system; a second storage control unit configured to control the second storage control unit, the second storage control unit including a second connection to connect with a second host system; a first path through which data is transferred between the first connection and the first storage area; a second path through which data is transferred between the first storage area and the second storage control unit; a third path through which data is transferred between the second storage control unit and the second storage area; and a fourth path through which data is transferred between the second connection and the first storage control unit.

Independent claim 23 recites a group of storage systems including a first storage system, and a second storage system having a second connection to connect with a second host system and a second storage control unit to control a second storage area. The first storage system comprises a first storage area to store data; a first storage control unit configured to control the first storage area, the first storage control unit including a first connection to connect with a first host system; a first path through which data is transferred between the first connection and the first storage area; a second path through which data is transferred between the first storage control unit and the second storage control unit; and a third path through which data is transferred between the second connection and the first storage control unit.

Independent claim 26 recites a group of storage systems including a first storage system having a first connection to connect with a first host system and a first storage control unit to control a first storage area, and a second storage system. The second storage system comprises a second storage area to store data; a second storage control unit configured to control a second storage area, the second storage control unit including a second connection to connect with a second host system; a first path through which data is transferred between the second connection and the first storage control unit; and a second path through which data is transferred between the first storage control unit and the second storage control unit.

One benefit that may be derived is that the sub-host computer can perform I/O processings for the subvolume even when the subvolume is paired with the main volume while data matching with the main volume is kept.

B. Discussion of the References

Overview

None of the references teaches the following sequence of writing data to different storage areas. The first storage control unit, in response to a first write request issued to write data in the first storage area from the first host system, writes data associated with the first write request to the first storage area and transfers the first write request to the second storage control unit to write the data associated with the first write request to the second storage area. The second storage control unit, in response to a second write request to write data in the second storage area, transfers the second write request to the first storage control unit, prior to writing data associated with the second write request to the second storage area. Some or all of these aspects are recited in independent claims 1, 5, 8, 11, 15, and 17.

The references further fail to teach the following sequence of writing data to different storage areas. A storage system provides a first path through which data is transferred between the first connection (connecting the first storage control unit with the first host system) and the first storage area (e.g., for writing data associated with the first write request to the first storage area); a second path through which data is transferred between the first storage area and the second storage control unit (e.g., for transferring the first write request to the second storage control unit); a third path through which data is transferred between the second storage control unit and the second storage area (e.g., for writing data associated with the first write request to the second storage area); and a fourth path through which data is transferred between the second connection (connecting the second storage control unit with the second host system) and the first storage control unit (e.g., for transferring the second write request to the first storage control unit). See independent claim 20.

The references also fail to teach the following sequence of writing data to different storage areas. A storage system provides a first path through which data is transferred between the first connection and the first storage area (e.g., for writing data associated with the first write request to the first storage area); a second path through which data is transferred between the first storage control unit and the second storage control unit

(e.g., for transferring the first write request to the second storage control unit to write data to the second storage area); a third path through which data is transferred between the second connection and the first storage control unit (e.g., for transferring the second write request to the first storage control unit to write data to the first storage area). See independent claim 23.

The references also fail to teach the following sequence of writing data to different storage areas. A storage system provides a first path through which data is transferred between the second connection and the first storage control unit (e.g., for transferring the second write request to the first storage control unit to write data to the first storage area); and a second path through which data is transferred between the first storage control unit and the second storage control unit (e.g., for transferring the second write request to the second storage control unit to write data associated with the second write request to the second storage area afterward). See independent claim 26.

1. U.S. Patent No. 4,310,883

This reference discloses method and apparatus for assigning data sets to virtual volumes in a mass store. A storage system has a multiplicity of storage volumes containing addressable data. The assignment of newly received data sets to the storage volume is accomplished by determining the best match of the data set to the available volumes. The best volume is one that provides memory space efficiency for the job at hand, and considers the volume life expectancy, the numbers of users, the shareability of the volume, and the status of the volume. The best volume selector 32 selects the eligible volumes from the volume records in the MSVI register 26 and places these volume records in a list according to best to worst fit for the data set. The best volume records are directed to a selected volumes register 34 for transmission to the mass storage controller 18 which makes the cartridges of the volumes selected available for the storage of the data set information. See column 13, lines 13-20. The apparatus of Fig. 6 together with the apparatus of Fig. 3 comprises a means for selecting the volumes that best matches the requirements of the data set that is to be stored into that volume. Fig. 8 shows a procedure for accomplishing the volume selection.

The reference is directed to selecting the best volume for newly received data. It does not disclose the sequence of writing data to different storage areas as claimed. The

reference fails to teach that in response to a second write request issued to write data in the second storage area, the second storage control unit is configured to transfer the second write request to the first storage control unit, as recited in independent claim 1; that in response to a second write request issued to write data in the second storage area by the second host system, the first storage control unit is configured to receive the second write request prior to writing data associated with the second write request to the second storage area, as recited in independent claim 5; that in response to a second write request issued to write data in the second storage area from the second host system, the second storage control unit is configured to transfer the second write request to the first storage system to write data associated with the second write request to the first storage area prior to writing the data associated with the second write request to the second storage area, as recited in independent claim 8; in response to a second write request issued to write data in the second storage area, transferring the second write request from the second storage control unit to the first storage control unit prior to writing data associated with the second write request to the second storage area, as recited in independent claim 11; in response to a second write request issued to write data in the second storage area by a second host system, receiving the second write request to write data associated with the second write request to the first storage area prior to writing the data associated with the second write request to the second storage area, as recited in independent claim 15; in response to a second write request issued to write data in the second storage area from a second host system, transferring the second write request to the first storage control unit to write data associated with the second write request to the first storage area prior to writing the data associated with the second write request to the second storage area, as recited in independent claim 17.

The reference further fails to teach (1) a first path through which data is transferred between the first connection and the first storage area; a second path through which data is transferred between the first storage area and the second storage control unit; a third path through which data is transferred between the second storage control unit and the second storage area; and a fourth path through which data is transferred between the second connection and the first storage control unit, as recited in independent claim 20; (2) a first path through which data is transferred between the first connection and the first storage area; a second path through which data is transferred between the first storage control unit and the

second storage control unit; and a third path through which data is transferred between the second connection and the first storage control unit, as recited in independent claim 23; or (3) a first path through which data is transferred between the second connection and the first storage control unit; and a second path through which data is transferred between the first storage control unit and the second storage control unit, as recited in independent claim 26.

2. U.S. Patent No. 6,073,218

This reference discloses method and apparatus for coordinating shared multiple RAID controller access to common storage devices. More specifically, it discloses a method and an associated apparatus for performing concurrent I/O operations on a common shared subset of disk drives by a plurality of RAID controllers 118. Each of a plurality of RAID controllers may actively process different I/O requests on a common shared subset of disk drives 110. One of the controllers is designated as primary with respect to a particular shared subset of disk drives. The RAID controllers exchange messages over a communication medium 150 to coordinate concurrent access to the shared subset of disk drives through the primary controller.

The reference provides concurrent I/O operations on a common shared subset of disk drives. Although the reference discusses access to shared disk drives, it does not disclose the sequence of writing data to different storage areas as claimed. The reference fails to teach that in response to a second write request issued to write data in the second storage area, the second storage control unit is configured to transfer the second write request to the first storage control unit, as recited in independent claim 1; that in response to a second write request issued to write data in the second storage area by the second host system, the first storage control unit is configured to receive the second write request prior to writing data associated with the second write request to the second storage area, as recited in independent claim 5; that in response to a second write request issued to write data in the second storage area from the second host system, the second storage control unit is configured to transfer the second write request to the first storage system to write data associated with the second write request to the first storage area prior to writing the data associated with the second write request to the second storage area, as recited in independent claim 8; in response to a second write request issued to write data in the second storage area, transferring the second write request from the second storage control unit to the first storage control unit prior to writing

data associated with the second write request to the second storage area, as recited in independent claim 11; in response to a second write request issued to write data in the second storage area by a second host system, receiving the second write request to write data associated with the second write request to the first storage area prior to writing the data associated with the second write request to the second storage area, as recited in independent claim 15; in response to a second write request issued to write data in the second storage area from a second host system, transferring the second write request to the first storage control unit to write data associated with the second write request to the first storage area prior to writing the data associated with the second write request to the second storage area, as recited in independent claim 17.

The reference further fails to teach (1) a first path through which data is transferred between the first connection and the first storage area; a second path through which data is transferred between the first storage area and the second storage control unit; a third path through which data is transferred between the second storage control unit and the second storage area; and a fourth path through which data is transferred between the second connection and the first storage control unit, as recited in independent claim 20; (2) a first path through which data is transferred between the first connection and the first storage area; a second path through which data is transferred between the first storage control unit and the second storage control unit; and a third path through which data is transferred between the second connection and the first storage control unit, as recited in independent claim 23; or (3) a first path through which data is transferred between the second connection and the first storage control unit; and a second path through which data is transferred between the first storage control unit and the second storage control unit, as recited in independent claim 26.

3. U.S. Patent No. 6,247,099 B1

This reference discloses system and method for maintaining cache coherency and data synchronization in a computer system having multiple caching storage controllers operating in unison supplying data in response to requests from one or more host computers. To provide data synchronization in a system before a write operation can be completed, first the write is received for particular data extents within a storage volume to first controller 106; next, the controller which receives the write must first allocate space for the data within its local cache and then bring the data in from the host system. In a third step, the write is

received by the second controller (controller B) 108 for the same data extents within the storage volume 110 as was previously written to the first controller 106. In the fourth step, the second controller (controller B) must first give permission to accept the data from controller A 106. This is accomplished by making a lock request to controller A for the data extent. In a fifth step, controller A 106 must first move the previously written data to the backing storage medium 110. At this point the data has been synchronized between controller A and controller B since the new data has not been received by controller B. In step six, the data in controller A which overlaps the data extent which was requested by controller B must now be invalidated. In step seven, after the data has been written to the backing storage medium 110, and cache lines within the data extent are invalidated, the lock request can be granted to controller B. In step eight, controller B can now acquire the required cache lines and accept data from the host system. Column 7, lines 23-55.

The reference is directed to maintaining coherency and data synchronization during a write operation. The movement of data is different from the sequence of writing data to different storage areas as claimed. The reference fails to teach that in response to a second write request issued to write data in the second storage area, the second storage control unit is configured to transfer the second write request to the first storage control unit, as recited in independent claim 1; that in response to a second write request issued to write data in the second storage area by the second host system, the first storage control unit is configured to receive the second write request prior to writing data associated with the second write request to the second storage area, as recited in independent claim 5; that in response to a second write request issued to write data in the second storage area from the second host system, the second storage control unit is configured to transfer the second write request to the first storage system to write data associated with the second write request to the first storage area prior to writing the data associated with the second write request to the second storage area, as recited in independent claim 8; in response to a second write request issued to write data in the second storage area, transferring the second write request from the second storage control unit to the first storage control unit prior to writing data associated with the second write request to the second storage area, as recited in independent claim 11; in response to a second write request issued to write data in the second storage area by a second host system, receiving the second write request to write data associated with the second write

request to the first storage area prior to writing the data associated with the second write request to the second storage area, as recited in independent claim 15; in response to a second write request issued to write data in the second storage area from a second host system, transferring the second write request to the first storage control unit to write data associated with the second write request to the first storage area prior to writing the data associated with the second write request to the second storage area, as recited in independent claim 17.

The reference further fails to teach (1) a first path through which data is transferred between the first connection and the first storage area; a second path through which data is transferred between the first storage area and the second storage control unit; a third path through which data is transferred between the second storage control unit and the second storage area; and a fourth path through which data is transferred between the second connection and the first storage control unit, as recited in independent claim 20; (2) a first path through which data is transferred between the first connection and the first storage area; a second path through which data is transferred between the first storage control unit and the second storage control unit; and a third path through which data is transferred between the second connection and the first storage control unit, as recited in independent claim 23; or (3) a first path through which data is transferred between the second connection and the first storage control unit; and a second path through which data is transferred between the first storage control unit and the second storage control unit, as recited in independent claim 26.

4. U.S. Patent No. 6,574,709 B1

This reference discloses system, apparatus, and method for providing cache data mirroring to a data storage system. Cache data is mirrored from a first controller to an alternate controller in a data storage system, where the data storage system is managed by controllers in dual active configuration, and the first and alternate controllers are also connected to a system drive that includes one or more disk storage devices, and the first controller and the alternate controller are connected to memories. As shown in Fig. 7, cache data mirror process (CDMP) 300 receives a write data request 305 from a host computer requesting that a set of data be stored to a system drive by the controller. At step 307, I/O Processing 20200 locates a number of free cache lines in user cache 110. The number of free cache lines that are required depends on how many sectors the host is writing. At step 310, each data structure (e.g., memory track 4000) representing a cache line's worth of data in the

IOP that is managing write data request 305 is mapped to a respective free cache line. At step 315, Index J is set to equal zero, and is used to iterate through each cache line of data being written to the controller and subsequently mirrored to an alternate controller in response to receiving write data request 305. At step 320, a host interface module in I/O Processor 22 is then commanded by code executing in CPU 15 to transfer data from a host bus (e.g., host peripheral bus 10) into cache line J. At step 325, it is determined whether this controller has established a nexus with an alternate, or partner controller in a data storage system (e.g., system 100). At step 345, if a nexus between controllers has not been established (step 325), it is determined if there are any more cache lines to process. If so, at step 350, index J is set to equal J+1. Otherwise, CDMP 300 ends. Column 18, line 54 to column 19, line 50.

The reference is directed to mirroring cache data from one controller to an alternate controller. Although it discusses managing a write data request from a host computer, it does not disclose the sequence of writing data to different storage areas as claimed. The reference fails to teach that in response to a second write request issued to write data in the second storage area, the second storage control unit is configured to transfer the second write request to the first storage control unit, as recited in independent claim 1; that in response to a second write request issued to write data in the second storage area by the second host system, the first storage control unit is configured to receive the second write request prior to writing data associated with the second write request to the second storage area, as recited in independent claim 5; that in response to a second write request issued to write data in the second storage area from the second host system, the second storage control unit is configured to transfer the second write request to the first storage system to write data associated with the second write request to the first storage area prior to writing the data associated with the second write request to the second storage area, as recited in independent claim 8; in response to a second write request issued to write data in the second storage area, transferring the second write request from the second storage control unit to the first storage control unit prior to writing data associated with the second write request to the second storage area, as recited in independent claim 11; in response to a second write request issued to write data in the second storage area by a second host system, receiving the second write request to write data associated with the second write request to the first storage area prior to

writing the data associated with the second write request to the second storage area, as recited in independent claim 15; in response to a second write request issued to write data in the second storage area from a second host system, transferring the second write request to the first storage control unit to write data associated with the second write request to the first storage area prior to writing the data associated with the second write request to the second storage area, as recited in independent claim 17.

The reference further fails to teach (1) a first path through which data is transferred between the first connection and the first storage area; a second path through which data is transferred between the first storage area and the second storage control unit; a third path through which data is transferred between the second storage control unit and the second storage area; and a fourth path through which data is transferred between the second connection and the first storage control unit, as recited in independent claim 20; (2) a first path through which data is transferred between the first connection and the first storage area; a second path through which data is transferred between the first storage control unit and the second storage control unit; and a third path through which data is transferred between the second connection and the first storage control unit, as recited in independent claim 23; or (3) a first path through which data is transferred between the second connection and the first storage control unit; and a second path through which data is transferred between the first storage control unit and the second storage control unit, as recited in independent claim 26.

5. U.S. Patent Publication No. 2003/0221077 A1

This reference discloses a method for controlling storage system and a storage control apparatus. The apparatus includes a host computer, and a first and a second storage control apparatuses each receiving a data input/output request from the host computer and executing a data input/output process for a storage device in response to the request. When the first apparatus 10 has judged that the first request is not for the first apparatus, the first apparatus 10 transmits a second input/output request corresponding to the first request to the second apparatus 20 through the second path. The second apparatus 20 receives the second request and executes a data input/output process corresponding to the second request received. See paragraphs [0092]-[0107].

The reference discloses that when the first apparatus has judged that the first data input/output request is not for the first apparatus, the first apparatus transmits a second input/output request corresponding to the first request to the second apparatus through the second path. In the present invention as claimed, however, the second storage control unit transfers the second write request to the first storage control unit prior to writing the data associated with the second write request to the second storage area. The reference does not disclose the sequence of writing data to different storage areas as claimed. The reference fails to teach that in response to a second write request issued to write data in the second storage area, the second storage control unit is configured to transfer the second write request to the first storage control unit, as recited in independent claim 1; that in response to a second write request issued to write data in the second storage area by the second host system, the first storage control unit is configured to receive the second write request prior to writing data associated with the second write request to the second storage area, as recited in independent claim 5; that in response to a second write request issued to write data in the second storage area from the second host system, the second storage control unit is configured to transfer the second write request to the first storage system to write data associated with the second write request to the first storage area prior to writing the data associated with the second write request to the second storage area, as recited in independent claim 8; in response to a second write request issued to write data in the second storage area, transferring the second write request from the second storage control unit to the first storage control unit prior to writing data associated with the second write request to the second storage area, as recited in independent claim 11; in response to a second write request issued to write data in the second storage area by a second host system, receiving the second write request to write data associated with the second write request to the first storage area prior to writing the data associated with the second write request to the second storage area, as recited in independent claim 15; in response to a second write request issued to write data in the second storage area from a second host system, transferring the second write request to the first storage control unit to write data associated with the second write request to the first storage area prior to writing the data associated with the second write request to the second storage area, as recited in independent claim 17.

The reference further fails to teach (1) a first path through which data is transferred between the first connection and the first storage area; a second path through which data is transferred between the first storage area and the second storage control unit; a third path through which data is transferred between the second storage control unit and the second storage area; and a fourth path through which data is transferred between the second connection and the first storage control unit, as recited in independent claim 20; (2) a first path through which data is transferred between the first connection and the first storage area; a second path through which data is transferred between the first storage control unit and the second storage control unit; and a third path through which data is transferred between the second connection and the first storage control unit, as recited in independent claim 23; or (3) a first path through which data is transferred between the second connection and the first storage control unit; and a second path through which data is transferred between the first storage control unit and the second storage control unit, as recited in independent claim 26.

6. U.S. Patent Publication No. 2004/0107325 A1

This reference relates to a storage system that controls duplication of data in a first logical volume 71 to be stored in real time in a second logical volume 72 different therefrom, and makes a logical volume identifier and a data set identifier for the first logical volume described in the first volume's management information and a logical volume identifier and a data set identifier for the second volume described in the second volume's management information match during the duplication. The storage system generates a control program for setting the first volume's logical volume identifier and data set identifier in the first volume's management information and the second volume's logical volume identifier and data set identifier in the second volume's management information to differ and, by executing this program, makes the second volume be recognized by an OS 12 as a volume independent of the first volume. By the automatic operations performed by the control program, there will be fewer occurrences of human errors. Thus, the second logical volume may be readily and easily recognized as a volume independent of the first logical volume for the direct access such as data I/O. See paragraph [0045].

The reference is directed to duplication of data in a first logical volume in a second logical volume, and providing logical volume identifiers to distinguish the two. It does not disclose the sequence of writing data to different storage areas as claimed. The

reference fails to teach that in response to a second write request issued to write data in the second storage area, the second storage control unit is configured to transfer the second write request to the first storage control unit, as recited in independent claim 1; that in response to a second write request issued to write data in the second storage area by the second host system, the first storage control unit is configured to receive the second write request prior to writing data associated with the second write request to the second storage area, as recited in independent claim 5; that in response to a second write request issued to write data in the second storage area from the second host system, the second storage control unit is configured to transfer the second write request to the first storage system to write data associated with the second write request to the first storage area prior to writing the data associated with the second write request to the second storage area, as recited in independent claim 8; in response to a second write request issued to write data in the second storage area, transferring the second write request from the second storage control unit to the first storage control unit prior to writing data associated with the second write request to the second storage area, as recited in independent claim 11; in response to a second write request issued to write data in the second storage area by a second host system, receiving the second write request to write data associated with the second write request to the first storage area prior to writing the data associated with the second write request to the second storage area, as recited in independent claim 15; in response to a second write request issued to write data in the second storage area from a second host system, transferring the second write request to the first storage control unit to write data associated with the second write request to the first storage area prior to writing the data associated with the second write request to the second storage area, as recited in independent claim 17.

The reference further fails to teach (1) a first path through which data is transferred between the first connection and the first storage area; a second path through which data is transferred between the first storage area and the second storage control unit; a third path through which data is transferred between the second storage control unit and the second storage area; and a fourth path through which data is transferred between the second connection and the first storage control unit, as recited in independent claim 20; (2) a first path through which data is transferred between the first connection and the first storage area; a second path through which data is transferred between the first storage control unit and the

second storage control unit; and a third path through which data is transferred between the second connection and the first storage control unit, as recited in independent claim 23; or (3) a first path through which data is transferred between the second connection and the first storage control unit; and a second path through which data is transferred between the first storage control unit and the second storage control unit, as recited in independent claim 26.

7. U.S. Patent No. 6,467,034 B1

This reference discloses a data mirroring method that makes it possible to change the data mirroring mode among three kinds of data mirroring modes with the three kinds of modes according to the degree of burdens on the hosts and the respective controllers. The disk mirroring method selects one of three data mirroring modes including a synchronous mode (Fig. 2), a semi-synchronous mode (Fig. 3), and an adaptive copy mode (Fig. 4). See column 7, line 7 to column 8, line 55. The three modes have different processing speeds.

The reference is directed to different data mirroring modes, but it does not disclose the sequence of writing data to different storage areas as claimed. The reference fails to teach that in response to a second write request issued to write data in the second storage area, the second storage control unit is configured to transfer the second write request to the first storage control unit, as recited in independent claim 1; that in response to a second write request issued to write data in the second storage area by the second host system, the first storage control unit is configured to receive the second write request prior to writing data associated with the second write request to the second storage area, as recited in independent claim 5; that in response to a second write request issued to write data in the second storage area from the second host system, the second storage control unit is configured to transfer the second write request to the first storage system to write data associated with the second write request to the first storage area prior to writing the data associated with the second write request to the second storage area, as recited in independent claim 8; in response to a second write request issued to write data in the second storage area, transferring the second write request from the second storage control unit to the first storage control unit prior to writing data associated with the second write request to the second storage area, as recited in independent claim 11; in response to a second write request issued to write data in the second storage area by a second host system, receiving the second write request to write data

associated with the second write request to the first storage area prior to writing the data associated with the second write request to the second storage area, as recited in independent claim 15; in response to a second write request issued to write data in the second storage area from a second host system, transferring the second write request to the first storage control unit to write data associated with the second write request to the first storage area prior to writing the data associated with the second write request to the second storage area, as recited in independent claim 17.

The reference further fails to teach (1) a first path through which data is transferred between the first connection and the first storage area; a second path through which data is transferred between the first storage area and the second storage control unit; a third path through which data is transferred between the second storage control unit and the second storage area; and a fourth path through which data is transferred between the second connection and the first storage control unit, as recited in independent claim 20; (2) a first path through which data is transferred between the first connection and the first storage area; a second path through which data is transferred between the first storage control unit and the second storage control unit; and a third path through which data is transferred between the second connection and the first storage control unit, as recited in independent claim 23; or (3) a first path through which data is transferred between the second connection and the first storage control unit; and a second path through which data is transferred between the first storage control unit and the second storage control unit, as recited in independent claim 26.

8. Japanese Patent Publication No. 07-234811

This reference relates to a remote file control system to minimize the time difference of deviation between the contents of files of a main and a subordinate center, and an increase in load due to modification of an application program and file transfer by a host system, by sending update contents to another controller in parallel to a process for storing the update contents. As a remote file is updated, software A1 instructs a file controller FCUA to update the file. Then, the file controller FCUA updates the file and also transfers the file to a file controller FCUB at the transfer destination of the remote file. The file controller FCUB having received this file writes this file in a volume VOLB under control according to the definitions of the remote file. In this case, the host A once confirming that the update to the volume VOLB is all ended informs the host B of that and synchronizes the remote file.

The reference is directed to updating data in a remote file and synchronizing the remote file. It does not disclose the sequence of writing data to different storage areas as claimed. The reference fails to teach that in response to a second write request issued to write data in the second storage area, the second storage control unit is configured to transfer the second write request to the first storage control unit, as recited in independent claim 1; that in response to a second write request issued to write data in the second storage area by the second host system, the first storage control unit is configured to receive the second write request prior to writing data associated with the second write request to the second storage area, as recited in independent claim 5; that in response to a second write request issued to write data in the second storage area from the second host system, the second storage control unit is configured to transfer the second write request to the first storage system to write data associated with the second write request to the first storage area prior to writing the data associated with the second write request to the second storage area, as recited in independent claim 8; in response to a second write request issued to write data in the second storage area, transferring the second write request from the second storage control unit to the first storage control unit prior to writing data associated with the second write request to the second storage area, as recited in independent claim 11; in response to a second write request issued to write data in the second storage area by a second host system, receiving the second write request to write data associated with the second write request to the first storage area prior to writing the data associated with the second write request to the second storage area, as recited in independent claim 15; in response to a second write request issued to write data in the second storage area from a second host system, transferring the second write request to the first storage control unit to write data associated with the second write request to the first storage area prior to writing the data associated with the second write request to the second storage area, as recited in independent claim 17.

The reference further fails to teach (1) a first path through which data is transferred between the first connection and the first storage area; a second path through which data is transferred between the first storage area and the second storage control unit; a third path through which data is transferred between the second storage control unit and the second storage area; and a fourth path through which data is transferred between the second connection and the first storage control unit, as recited in independent claim 20; (2) a first

path through which data is transferred between the first connection and the first storage area; a second path through which data is transferred between the first storage control unit and the second storage control unit; and a third path through which data is transferred between the second connection and the first storage control unit, as recited in independent claim 23; or (3) a first path through which data is transferred between the second connection and the first storage control unit; and a second path through which data is transferred between the first storage control unit and the second storage control unit, as recited in independent claim 26.

9. Japanese Patent Publication No. 2001-273342

This reference discloses a product manufacturing support method for performing a designing job and a mass production preparatory job in parallel to each other by evaluating quality of a designed product not based on its prototype. The support method includes a treatment process where the product component information and production process information are described in a tree structure and the list information is produced for describing the information on images which are stuck on both component and production process, a treatment process where a product work procedure sheet is produced by generating the work procedure information including the images to be stuck on the processes described in the list information, and a treatment process where a visual kitting list of products is produced by producing a kitting list consisting of a list of images of product components which are described in the list information.

As discussed in the present application at paragraph [0004], this reference discloses a method for forming each storage volume in such a dual configuration is to connect each of two storage control units connected to two host computers to a main volume or subvolume. When the main host computer writes data in the main volume, the storage control unit copies the data from the main volume to the subvolume. The state between the main volume and the subvolume after such a copy operation is referred to a paired state. The sub-host computer cannot access any subvolume in such a paired state. Conventionally, it has been impossible for a sub-host computer to access to any paired storage volume until the paired state is reset. In other words, the sub-host computer cannot access any storage volume while the storage volume is in a paired state.

The reference does not disclose the sequence of writing data to different storage areas as claimed. The reference fails to teach that in response to a second write request issued to write data in the second storage area, the second storage control unit is configured to transfer the second write request to the first storage control unit, as recited in independent claim 1; that in response to a second write request issued to write data in the second storage area by the second host system, the first storage control unit is configured to receive the second write request prior to writing data associated with the second write request to the second storage area, as recited in independent claim 5; that in response to a second write request issued to write data in the second storage area from the second host system, the second storage control unit is configured to transfer the second write request to the first storage system to write data associated with the second write request to the first storage area prior to writing the data associated with the second write request to the second storage area, as recited in independent claim 8; in response to a second write request issued to write data in the second storage area, transferring the second write request from the second storage control unit to the first storage control unit prior to writing data associated with the second write request to the second storage area, as recited in independent claim 11; in response to a second write request issued to write data in the second storage area by a second host system, receiving the second write request to write data associated with the second write request to the first storage area prior to writing the data associated with the second write request to the second storage area, as recited in independent claim 15; in response to a second write request issued to write data in the second storage area from a second host system, transferring the second write request to the first storage control unit to write data associated with the second write request to the first storage area prior to writing the data associated with the second write request to the second storage area, as recited in independent claim 17.

The reference further fails to teach (1) a first path through which data is transferred between the first connection and the first storage area; a second path through which data is transferred between the first storage area and the second storage control unit; a third path through which data is transferred between the second storage control unit and the second storage area; and a fourth path through which data is transferred between the second connection and the first storage control unit, as recited in independent claim 20; (2) a first path through which data is transferred between the first connection and the first storage area;

a second path through which data is transferred between the first storage control unit and the second storage control unit; and a third path through which data is transferred between the second connection and the first storage control unit, as recited in independent claim 23; or (3) a first path through which data is transferred between the second connection and the first storage control unit; and a second path through which data is transferred between the first storage control unit and the second storage control unit, as recited in independent claim 26.

10. Japanese Patent Publication No. 2000-222267

This reference relates to a remote file transfer system to simultaneously accept plural remote transfer designating instructions to the same machine number. The system has a regular center and a subordinate center respectively provided with a volume 3a having a machine number to store data and a file controller 2 for controlling the write/read of data to the volume 3a. An area for storing a data overwrite prevention counter is provided for plural storage units of one machine number setting the remote volume correspondence relation of both the regular and subordinate centers. The subordinate center compares the value of the data overwrite prevention counter for data transferred from the regular center with the value of the data overwrite prevention counter held in the subordinate center and writes data, for which the order of data is right, transferred from the regular center into the volume 3a.

The reference is directed to controlling write/read of data to a volume in a subordinate center and providing data overwrite prevention counter setting the remote volume correspondence relation of both the regular and the subordinate centers. It does not disclose the sequence of writing data to different storage areas as claimed. The reference fails to teach that in response to a second write request issued to write data in the second storage area, the second storage control unit is configured to transfer the second write request to the first storage control unit, as recited in independent claim 1; that in response to a second write request issued to write data in the second storage area by the second host system, the first storage control unit is configured to receive the second write request prior to writing data associated with the second write request to the second storage area, as recited in independent claim 5; that in response to a second write request issued to write data in the second storage area from the second host system, the second storage control unit is configured to transfer the second write request to the first storage system to write data associated with the second write request to the first storage area prior to writing the data associated with the second write

request to the second storage area, as recited in independent claim 8; in response to a second write request issued to write data in the second storage area, transferring the second write request from the second storage control unit to the first storage control unit prior to writing data associated with the second write request to the second storage area, as recited in independent claim 11; in response to a second write request issued to write data in the second storage area by a second host system, receiving the second write request to write data associated with the second write request to the first storage area prior to writing the data associated with the second write request to the second storage area, as recited in independent claim 15; in response to a second write request issued to write data in the second storage area from a second host system, transferring the second write request to the first storage control unit to write data associated with the second write request to the first storage area prior to writing the data associated with the second write request to the second storage area, as recited in independent claim 17.

The reference further fails to teach (1) a first path through which data is transferred between the first connection and the first storage area; a second path through which data is transferred between the first storage area and the second storage control unit; a third path through which data is transferred between the second storage control unit and the second storage area; and a fourth path through which data is transferred between the second connection and the first storage control unit, as recited in independent claim 20; (2) a first path through which data is transferred between the first connection and the first storage area; a second path through which data is transferred between the first storage control unit and the second storage control unit; and a third path through which data is transferred between the second connection and the first storage control unit, as recited in independent claim 23; or (3) a first path through which data is transferred between the second connection and the first storage control unit; and a second path through which data is transferred between the first storage control unit and the second storage control unit, as recited in independent claim 26.

(f) In view of this petition, the Examiner is respectfully requested to issue a first Office Action at an early date.

Respectfully submitted,

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